

THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of : Group Art Unit: 1793
Kazuhiro Oda et al. : Examiner: Roe, Jessee Randall
Serial. No. : 10/593,338 :
Filed: September 19, 2006 :
For: ALUMINUM ALLOY FOR :
CASTING, HAVING HIGH RIGIDITY:
AND LOW LINER EXPANSION :
COEFFICIENT : :

Declaration Under 37 C.F.R. § 1.132

Honorable Commissioner for Patents
Alexandria, Virginia 22313

Dear Honorable Sir:

I, Kazuhiro Oda, do hereby declare the following:

1. I received my Dr. of Engineering in Material Engineering from Tohoku University in March 1998. Currently, I am employed as a researcher at Nippon Light Metal Company, Ltd., which I joined in April 1998. Moreover, I am presently engaged in the research and development of Aluminum Shape Casting, which I began on May 6th, 1998.
2. I have reviewed the Office Action dated September 16, 2008, in which the claims were rejected under 35 U.S.C.103(a) as being unpatentable over Nishi et al. (US 4,919,736), and/or Horikawa et al. (JP 2000-204428). In the abovementioned Office Action the Examiner asserted that the aluminum alloy having the present composition would have been obvious to one of ordinary skill in the art at the time the invention was made. Accordingly, in the absence of evidence to the contrary, selecting the claimed range of the compositions would appear to require no more than routine investigation by those of ordinary skill in the art. However, I will hereinafter present direct

comparative experimental results between the claimed invention and the inventions of the prior art, Nishi et al., and Horikawa et al., which will further demonstrate the unexpected properties of the present invention.

3. *Comparative Experiment*

I proceeded to manufacture the aluminum alloys of the present invention, as well as the aluminum alloys of Horikawa et al. and Nishi et al., to thereby experimentally confirm the differences in the effects, i.e. rigidity and linear expansion coefficient, of the present invention and the inventions of Horikawa and Nishi, with said results thereof being described hereinafter.

The major compositions of the aluminum alloys described in each of the claimed inventions and the abovementioned Citations are listed in the below-indicated Table 1. Moreover, the major compositions of the aluminum alloys used in the present experiment are shown in table 2. The aluminum alloy of the present experiment was employed in a manner to similar to that described in the present specification. Specifically, after being cast in a 200×200×10 mm planar form at a casting temperature of 720 degrees Celsius, it was allowed to sit at a temperature of 200 degrees Celsius for 4 hours, and then the rigidity (Young's modulus) and the linear expansion coefficient (thermal expansion coefficient) were measured. In the below-indicated Table 2, inventions 1-7 represent the aluminum alloys of the present invention, with the comparative examples of Nishi et al. and Horikawa et al. of Table 1 representing the alloy disclosed in the abovementioned Citation, which does not satisfy at least one of the conditions for the range of the compositions described above.

In accordance with the abovementioned experiment of the present specification, the criterion for Young's modulus is understood as being 90 GPa, with any composition having a value above this deemed as satisfying this criterion. In particular, any composition with a Young's modulus of 95 GPa is deemed as being even more superior. Moreover, the criterion for the coefficient of linear thermal expansion is understood as being $18 \times 10^{-6} / ^\circ C$, with any composition having a value lower than this deemed as satisfying this criterion. In particular, any composition with a coefficient of linear thermal expansion of $17.5 \times 10^{-6} / ^\circ C$ is deemed as being even more superior.

	Major Composition						
	Si	Cu	Fe	Mn	P	Ni	Mg
Claim 4	13-25	2-8	0.5-3	1-3	0.001-0.02	-	-
Claim 5	13-25	2-8	0.5-3	1-3	0.001-0.02	0.5-6	-
Claim 7	13-25	2-8	0.5-3	1-3	0.001-0.02	0.5-6	-
Claim 8	13-25	2-8	0.5-3	1-3	0.001-0.02	0.5-6	-
Claim 9	13-25	2-8	0.5-3	1-3	0.001-0.02	0.5-6	-
Nishi Examples	13.5-20 13.0-15.6	6-9 4.04-7.12	1.6-3 0.68-1.88	0.5-2 0.41-1.48	0.001-0.1 0.05-0.07	0-0.5 0.06-0.08	- 1.16-3.04
Horikawa Examples	11-16 12.6	3-7 4.2	0.2-1.5 0.51	0.2-1.0 0.35	0.003-0.015 0.007	3-7 4.5	0.5-2.0 1.2

Table 1

	Major Composition							Young's Modulus	Coefficient of Linear Thermal Expansion [°C]
	Si	Cu	Fe	Mn	P	Ni	Mg		
Nishi	15	6	2	1.2	0.01	0	-	Poor	Good
Invention 1	15	6	2	1.2	0.01	0.5	-	Good	Good
Invention 2	15	6	2	1.2	0.01	1	-	Good	Good
Invention 3	15	6	2	1.2	0.01	3	-	Excellent	Excellent
Invention 4	15	6	2	1.2	0.01	6	-	Excellent	Excellent
Horikawa	15	5	2	0.2	0.01	3	1.5	Poor	Good
Invention 5	15	5	2	1	0.01	3	0	Good	Good
Invention 6	15	5	2	2	0.01	3	0	Good	Good
Invention 7	15	5	2	3	0.01	3	0	Excellent	Good

Table 2

4. The abovementioned compositions and measurement results are shown in Table 2.

As shown in the above-indicated Table 2, when the aluminum alloy of the present invention was compared to that of the corresponding Nishi et al., it had a superior Young's modulus, which clearly satisfied the abovementioned criterion of the present specification. It is thought that this allows for the desired amount of $\text{Al}_3(\text{Ni.Cu})_2$ to be produced, via the interaction between Ni and the specific composition described in the claims of the present specification, and allows for the desired Young's modulus (and the desired coefficient of linear thermal expansion) to be achieved.

As shown in the above-indicated Tables 1 and 2, the aluminum alloy of the present invention differs from the aluminum alloy of Horikawa et al., in that it does not include Mg. Moreover, as shown in above-indicated Table 2, when the aluminum alloy of the present invention was compared to that of the corresponding Horikawa et al., it had a superior Young's modulus, which clearly satisfied the abovementioned criterion of the present specification. It is thought that this is due to the fact that the Mg-free Si crystallized

product of the present invention contributes more to archiving a high Young's modulus (and low coefficient of linear thermal expansion) than the Mg₂Si crystallized product that is thought to be formed by the alloy of Horikawa et al.

5. In conclusion, I believe that the aluminum alloy with currently claimed range of compositions exhibits unexpected properties over Nishi et al. (US 4,919,736) and Horikawa et al. (JP 2000-204428), and thus, the present invention is not obvious in view of the abovementioned Citations.

6. I hereby declare all statements made herein as being true, that all information pertaining thereto is also believed to be true, and that all the abovementioned statements were made with full knowledge that any willfully falsified information, etc. is not only punishable by fines and/or imprisonment, as stipulated under Section 1001 of Title 18 of the United States Code, but may also jeopardize the validity of said application, as well as any patent issuing thereon.

Signature: Kazuhiko Oda

Date: Dec. 4th, 2008